Effect of Salinity Flux on Circulation and Salinity Distribution at East Asian Marginal Seas

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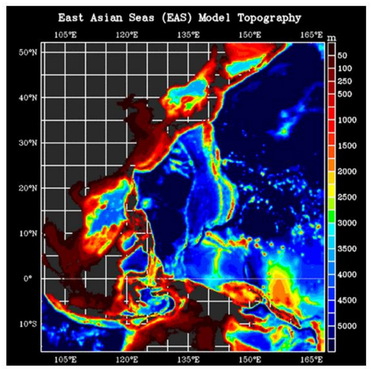
INTRODUCTION

The effect of salinity flux on the upper ocean circulation and the salinity distribution at the East Asian Seas is studied applying a numerical twin experiment. The Navy Coastal Ocean Model (NCOM), used in this study, has an 1/8-degree resolution with 25 vertical layers and covers entire Asian marginal seas including South China Sea, East China Sea, Yellow Sea and Sea of Japan. For the twin experiment, the model was initialized with climatology and forced with NOGAPS wind stress and heat flux. The open boundary is coupled to an 1/4-degree North Pacific ocean model. The salinity flux applied to one run is estimated from the difference between model surface salinity and the monthly climatology. Since there is low salinity water near the rivers in the climatology the applied salinity flux includes river effect. The twin experiment is conducted for a period started from July 1, 1994 and ended at Jan. 1, 1999. The last year of model output at upper 100 m are used for the analysis.

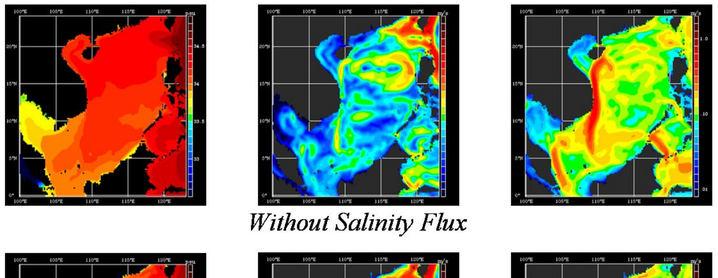


SUMMARY

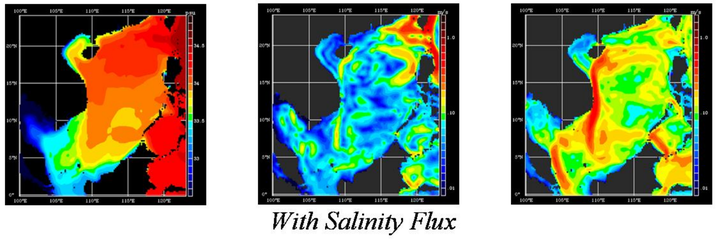
Based on a twin experiment applying an East Asian Seas model, the effect of salinity flux on the upper ocean circulation and salinity distribution has been investigated. It shows that in a short run, the salinity flux has no significant effect on the mean upper ocean current at the Asian marginal seas. The circulation are mainly driven by the wind. Without the salinity flux, the upper ocean salinity increases due to the influx of salty North Pacific Subtropical water through the straits that separate Asian marginal seas from North Pacific Ocean. The water becomes much saltier in regions where the fresh water discharge from a river is large or the precipitation is high. The saltier upper layer water may enhance the mixing resulting in larger current variability. The experiment also indicates that applying a salinity flux estimated from the difference between model surface salinity and the monthly climatology is effective in maintaining proper salinity distribution in the Asia marginal seas.

South China Sea

Average Salinity | Mean Current | Current Variability



Without Salinity Flux

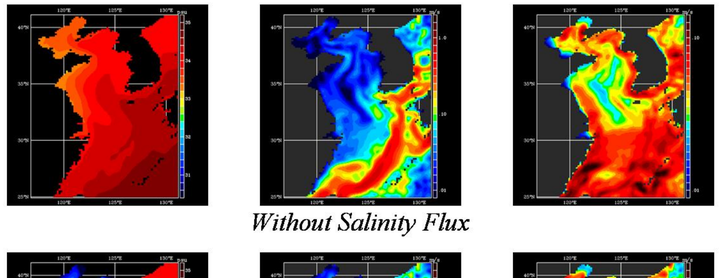


With Salinity Flux

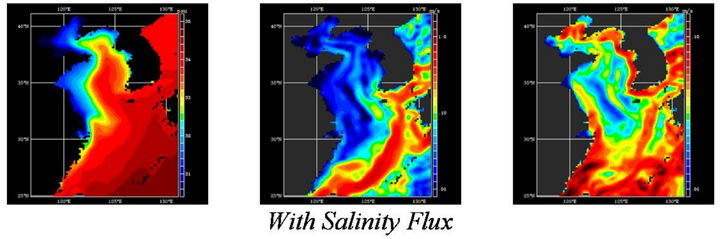
Kuroshio intrusion through Luzon Strait brings salty North Pacific Subtropical water into South China Sea. It is balanced by the fresh water flux from Equatorial SCS. Without any salinity flux, the upper ocean salinity increases. The higher salinity has only a small influence on the mean current and current variability except at northern part of SCS.

East China/Yellow Sea

Average Salinity | Mean Current | Current Variability



Without Salinity Flux

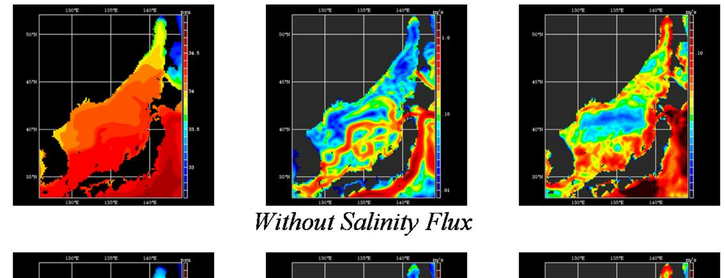


With Salinity Flux

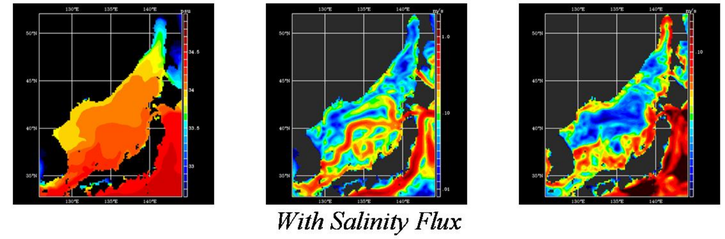
The salinity increases over the entire region without salinity flux. The increase is particularly significant along coast in the Yellow Sea where fresh water from river is substantial. There are no significant differences in the mean current however, the current variability increases without salinity flux.

Sea of Japan

Average Salinity | Mean Current | Current Variability



Without Salinity Flux



With Salinity Flux

The effect of salinity flux on the circulation and the salinity distribution at the Sea of Japan is not significant for the study period. The near surface salinity increases a small amount with salinity flux. The mean circulations are similar, but without salinity flux the current variability increases.